

PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Martin John Hofmann
Title: METHODS AND APPARATUS FOR PACKING
CHROMATOGRAPHY COLUMNS AND
CHROMATOGRAPHY COLUMN
Docket No.: 34516

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the examination of the above-identified patent application, it is requested that the following amendments be made.

IN THE CLAIMS:

Please amend the claims as follows.

1 3. (amended) Chromatography process according to
2 claim 1, comprising monitoring the attenuation of the
3 transmitted signal.

1 4. (amended) Chromatography process according to
2 claim 1, comprising said ultrasound signal transmission
3 through the bed space during packing of the particulate
4 medium into the bed space via a port in the wall of the
5 column housing, as a pumped slurry.

1 6. (amended) Chromatography process according to
2 claim 4, in which detected ultrasound signals are
3 transmitted transversely to the direction of accumulation
4 of the packed bed of medium.

1 7. (amended) Chromatography process according to
2 claim 4, in which detected ultrasound signals are
3 transmitted through the bed space at plural locations
4 distributed along the direction of accumulation of the
5 packed bed of medium.

1 9. (amended) Chromatography process according to
2 claim 7, in which respective real-time rates of advance
3 are determined for a plurality of said locations and
4 compared with respective target values constituting a
5 predetermined packing profile, and feedback control
6 signals sent to a packing pump in dependence on the
7 comparisons.

1 11. (amended) Chromatography process according to
2 claim 4, in which a control processor, operatively
3 connected to the packing pump and ultrasound detection
4 arrangement, is loaded with target packing data from a
5 discrete data carrier, and controls the packing pump in
6 dependence on comparisons between the detected and target
7 data.

1 12. (amended) Chromatography process according to
2 claim 4, in which a detected ultrasound transmission
3 adjacent that end of the bed space last filled by the
4 accumulating bed is used to detect the arrival of the
5 advancing bed front and thereby initiate reduction or
6 cessation of pump operation at the end of the packing
7 procedure.

1 13. (amended) Chromatography process according to
2 claim 4, in which a control processor is programmed to
3 respond to a detected dip in packing pressure,
4 corresponding to the bed space becoming full of medium,
5 by turning off the packing pump.

1 14. (amended) Chromatography process according to
2 claim 1, comprising said ultrasound transmission through
3 the bed space during the passage of process liquid
4 through the packed bed, to detect the presence and/or
5 position of a said component in or passing through the
6 bed.

1 16. (amended) Chromatography process according to
2 claim 1, in which a detected ultrasound transmission
3 through the packed bed adjacent an input end for the
4 process liquid is used to determine the extent of

5 encroachment of bound impurity into the bed from the
6 input end.

Please cancel claim 17 without prejudice.

1 20. (amended) Chromatography apparatus according to
2 claim 18, in which said transmitter and/or detector is on
3 the outside of the housing wall, so that the ultrasound
4 signal is transmitted to the detector through the wall as
5 well as through the bed space.

1 21. (amended) Chromatography apparatus according to
2 claim 18, in which plural said transmitters and/or plural
3 said detectors therefor are distributed along the column
4 in a direction between an inlet and an outlet of the
5 column.

1 22. (amended) Chromatography apparatus according to
2 claim 18, in which the column is a vertical cylinder,
3 e.g. with a steel side wall.

1 23. (amended) Chromatography apparatus according to
2 claim 18, comprising a control processor operatively
3 connected to the ultrasound transmitter and detector and
4 programmed to determine a speed and/or attenuation for

5 the transmissions between them via the internal bed
6 space.

1 24. (amended) Chromatography apparatus according to
2 claim 18, in which the chromatography column has a port
3 through its housing wall adapted for the injection of a
4 slurry of particulate medium for packing the column.

1 31. (amended) Chromatography packing apparatus
2 according to claim 29, comprising a set of the ultrasonic
3 transmitters and detectors.

1 32. (amended) Chromatography packing apparatus
2 according to claim 29, comprising a data reader for
3 reading a set of prescribed packing parameters for a
4 given column and medium from a discrete data carrier.

REMARKS

The foregoing amendments correct multiple claim dependency for purposes of calculating the claim fee.

Attached hereto are pages entitled "Version With Markings to Show Changes Made".

If there are any further fees required by this amendment not covered by an enclosed check, or if no check is enclosed, please charge the same to Deposit Account No. 16-0820, Order No. 34516.

Respectfully submitted,

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"VERSION WITH MARKINGS TO SHOW CHANGES MADE"

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Title: METHODS AND APPARATUS FOR PACKING
CHROMATOGRAPHY COLUMNS AND
CHROMATOGRAPHY COLUMN

Docket No.: 34516

IN THE CLAIMS:

The claims have been amended as follows.

1 3. (amended) Chromatography process according to
2 claim 1, [or 2] comprising monitoring the attenuation of
3 the transmitted signal.

1 4. (amended) Chromatography process according to
2 [any one of the preceding claims] claim 1, comprising
3 said ultrasound signal transmission through the bed space
4 during packing of the particulate medium into the bed
5 space via a port in the wall of the column housing, as a
6 pumped slurry.

1 6. (amended) Chromatography process according to
2 claim 4, [or 5] in which detected ultrasound signals are
3 transmitted transversely to the direction of accumulation
4 of the packed bed of medium.

1 7. (amended) Chromatography process according to
2 [any one of claims 4 to 6] claim 4, in which detected
3 ultrasound signals are transmitted through the bed space

4 at plural locations distributed along the direction of
5 accumulation of the packed bed of medium.

1 9. (amended) Chromatography process according to
2 claim 7, [or 8] in which respective real-time rates of
3 advance are determined for a plurality of said locations
4 and compared with respective target values constituting a
5 predetermined packing profile, and feedback control
6 signals sent to a packing pump in dependence on the
7 comparisons.

1 11. (amended) Chromatography process according to
2 [any one of claims 4 to 10] claim 4, in which a control
3 processor, operatively connected to the packing pump and
4 ultrasound detection arrangement, is loaded with target
5 packing data from a discrete data carrier, and controls
6 the packing pump in dependence on comparisons between the
7 detected and target data.

1 12. (amended) Chromatography process according to
2 [any one of claims 4 to 11] claim 4, in which a detected
3 ultrasound transmission adjacent that end of the bed
4 space last filled by the accumulating bed is used to
5 detect the arrival of the advancing bed front and thereby
6 initiate reduction or cessation of pump operation at the
7 end of the packing procedure.

1 13. (amended) Chromatography process according to
2 [any one of claims 4 to 12] claim 4, in which a control
3 processor is programmed to respond to a detected dip in
4 packing pressure, corresponding to the bed space becoming
5 full of medium, by turning off the packing pump.

1 14. (amended) Chromatography process according to
2 [any of the preceding claims] claim 1, comprising said
3 ultrasound transmission through the bed space during the
4 passage of process liquid through the packed bed, to
5 detect the presence and/or position of a said component
6 in or passing through the bed.

1 16. (amended) Chromatography process according to
2 [any one of the preceding claims] claim 1, in which a
3 detected ultrasound transmission through the packed bed
4 adjacent an input end for the process liquid is used to
5 determine the extent of encroachment of bound impurity
6 into the bed from the input end.

Claim 17 has been cancelled.

1 20. (amended) Chromatography apparatus according to
2 claim 18, [or 19] in which said transmitter and/or
3 detector is on the outside of the housing wall, so that

the ultrasound signal is transmitted to the detector
through the wall as well as through the bed space.

21. (amended) Chromatography apparatus according to
[any one of claims 18 to 20] claim 18, in which plural
said transmitters and/or plural said detectors therefor
are distributed along the column in a direction between
an inlet and an outlet of the column.

22. (amended) Chromatography apparatus according to
[any one of claims 18 to 21] claim 18, in which the
column is a vertical cylinder, e.g. with a steel side
wall.

23. (amended) Chromatography apparatus according to
[any one of claims 18 to 22] claim 18, comprising a
control processor operatively connected to the ultrasound
transmitter and detector and programmed to determine a
speed and/or attenuation for the transmissions between
them via the internal bed space.

24. (amended) Chromatography apparatus according to
[any one of claims 18 to 23] claim 18, in which the
chromatography column has a port through its housing wall
adapted for the injection of a slurry of particulate
medium for packing the column.

1 31. (amended) Chromatography packing apparatus
2 according to claim 29, [or 30] comprising a set of the
3 ultrasonic transmitters and detectors.

1 32. (amended) Chromatography packing apparatus
2 according to [any one of claims 29 to 31] claim 29,
3 comprising a data reader for reading a set of prescribed
4 packing parameters for a given column and medium from a
5 discrete data carrier.